

# Boeing Commercial Airplanes Airplane Certification and Regulatory Affairs

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## FAX LEAD SHEET

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Subject:	Comments to draft Report to Congress on the Costs and Benefits of Federal Regulations		

Attached *is* a copy of the comments that **Boeing Commercial Airplanes** is submitting to the subject document, which **comprise** our recommendations for reform. The original version of these comments has **been sent** to you via regular mail.

B-H300-02-JGD-042

Mr. John Morrall  
Office of Information and Regulatory Affairs  
Office of Management and Budget  
NEOB, Room 10235  
725 17th Street, NW.  
Washington, DC 20503

Subject: **Comments** to "Office of Management and Budget -- Draft Report to Congress on the **Costs** and Benefits of Federal Regulations; Notice and request for comments"

Dear Mr. Morrall:

Enclosed are comments from Boeing Commercial Airplanes responding to the Office of Management and Budget's request for public input on the subject draft report. We have directed our comments primarily at current regulations issued by the Federal Aviation Administration (**FAA**) that we have found to be:

- costly and burdensome without adequate justification of benefits, and
- not standardized in their application.

The regulations described in the enclosures to this **letter** are representative of two general concerns that we have with the **FAA** rulemaking **process**:

1. The **FAA's** economic analyses of the cost impact of proposed rules are sometimes understated by one to two orders of magnitude. On specific example **is** the "16g **Seats** Retrofit Rule," which is described in an enclosure to **this** letter. Other examples are also included in the enclosures. Such miscalculations **could be** overcome if the **FAA** had better resources, **processes**, and **networks** for obtaining factual financial impact data from the public most affected by the rule.
2. Specialists at the **FAA** are often not standardized in their interpretations of new rules, which creates variations in the implementation of requirements that are not congruent with the standard. This non-standardization regularly magnifies **the cost** of design, certification, and implementation to the point where it invalidates **the FAA's** "reasoned determination that the benefits of the intended regulation justify its cost." This could be overcome if the **FAA** had the resources to provide better training and monitoring of **its** specialists **who** are **tasked** with reviewing compliance with the regulations.

Mr. John Morall  
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**We** recognize the tremendous progress **made** in aviation **safety** over **the past 50** years **due** to the joint efforts of the aviation industry **and** government. The development of prudent and balanced regulations -- and compliance with them -- **has been** instrumental for ensuring that air travel **is one of** the safest modes of transportation in **the** world. Our comments in this letter **do not intend** to demean **those** accomplishments. **Instead**, they **serve as** suggestions for improvements that could **serve to build** an even healthier and more reliable **aviation system**.

**We** appreciate the opportunity that the Office of Management **and Budget** has provided to the public to comment on the draft report.

**Please** direct any comments or questions to **Ms. Jill DeMarco** of this office **at (425) 965-2015**.

Sincerely,

**Original signed by**

Jim Draxler  
Director, Airplane Certification and Regulatory **Affairs**

Enclosure

cc: Aerospace Industries Association  
Attention: Skip **Jones**, Director,  
**Engineering** and Certification  
1250 Eye Street, NW., Suite 1200  
Washington, DC 20005-3924

General Aviation Manufacturers **Association**  
Attention: Walter Desrosier  
1400 K Street **NW**, Suite **801**  
Washington, DC 20005

NAME OF REGULATION: 14 CFR §1.1, "General Definitions"	
<b>Regulating agency</b>	Department of Transportation / Federal Aviation Administration
<b>Citation</b>	Title 14, Code of Federal Regulations, Aeronautics & Space Subchapter A - Definitions Part 1 - Definitions and Abbreviations §1.1 General definitions.  Federal Register citation: 27 FR 4588, May 15, 1962
<b>Authority</b>	49 U.S.C. 106(g), 40113,44701
<b>Description of Problem</b>	<p>According to §1.1, the term <b>Major Repair</b> is defined as:</p> <ol style="list-style-type: none"> <li>(1) A repair that, if improperly done, might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness; or</li> <li>(2) A repair that is not done according to accepted practices or cannot be done by elementary operations.</li> </ol> <p>The term <b>Minor Repair</b> is defined as "a repair other than a major repair."</p> <p>Part 1 was last revised in 1962. Since that time, a considerable number of changes have been made to other parts of 14 CFR that address many issues, including the issue of repairs.</p> <p>Today, U.S. airlines are required to have a process to determine whether a repair is a "major" repair or a "minor" repair, and this process must be approved by the FAA. General aviation owners/operators also must determine if a repair is "major" or "minor" by determining how the repair would affect the airplane's weight, balance, structural strength, performance, etc., and the resulting analysis is then approved by the FAA. All of these repairs must be physically accomplished by an FAA-licensed mechanic who meets the appropriate requirements of 14 CFR Part 65, under either an FAA-approved repair station certificate or an FAA-approved airline maintenance program.</p> <p>In Europe, on the other hand, the parallel European regulations concerning major and minor repairs are similar, but delete the phrase "if improperly done" from the description of a major repair. The European rules assume that the repair is properly done (embodied) by an approved maintenance organization holding the appropriate airframe rating. Thus, repair classification in Europe (and essentially in the rest of the world outside the U.S.) deals with the repair <u>design</u>, not the repair <u>embodiment</u>. (Under the European regulations, a repair is considered a "design change," whereas, under 14 CFR, a repair is considered a "restoration to type design.") This difference creates a substantial difference in how the rule is implemented. The difference negatively impacts airlines operating airplanes on N-Registration. Additionally, it penalizes maintenance facilities that have regulatory approval by discounting the quality of their work.</p> <p>When an airplane is imported from Europe (or any other foreign country) to the U.S. before it can be placed on the U.S. register, the operator must, among other things, conduct an in-depth review of all repairs made to it, comparing each to the definition of "major" and "minor" as stated in 14 CFR. The FAA must then approve all identified by the review as "major." This process is lengthy and resource-consuming. It is costing U.S. airlines, foreign airlines operating U.S.-designed aircraft, and U.S.-designed aircraft being operated by foreign airlines and returning to the U.S. registry excessive amounts of money and resources, with very no improvement in safety.</p>

**NAME OF REGULATION: 14 CFR §1.1, "General Definitions"**

<p><b>Proposed Solution</b></p>	<p>In order to improve and streamline the approval of repairs, the following revision is suggested for the definition of "major repair":</p> <p>A repair is considered a <i>major repair</i> if --</p> <p>(1) the result on the approved type design has an appreciable effect on structural performance, weight, balance, system, operational characteristics, or other characteristics affecting the airworthiness of the product, part, or appliance.</p> <p>The following is suggested wording for the guidance material necessary to help to further explain the definition:</p> <p><b><u>Major Repair Guidance Material:</u></b></p> <p>In line with the definition that appears in 14 CFR §1.1, a repair is considered a "major repair" if the result of the repair on the approved type design has an appreciable effect on the structural performance, weight, balance, system, operational characteristics, or other characteristics affecting the airworthiness of the product, part, or appliance. In particular, a repair is classified as "major" if:</p> <p>(1) it needs extensive static, fatigue, and damage tolerance strength justification, and/or testing in its own right, or if it needs methods, techniques, or practices that are unusual (e.g., unusual material selection, heat treatment, material processes, etc); or</p> <p>(2) it requires a re-assessment or re-evaluation of the original certification substantiation data to ensure that the aircraft still complies with all the relevant requirements.</p>
<p><b>Estimate of Economic Impacts</b></p>	<p>As stated previously, the repair issue is costing operators excessive amounts of manpower and money, with very little improvement in safety in return. A conservative estimate of the cost of accomplishing this process on one airplane is one-quarter the resale value of the airplane itself. This makes U.S. products unattractive and contribute to an uneven playing field in the aviation market.</p>

NAME OF REGULATION: 14 CFR Part 25, Amendment 25-87, "Standards for Approval for High Altitude Operation of Subsonic Transport Airplanes"	
<b>Regulating agency</b>	Department of Transportation ■ Federal Aviation Administration
<b>Citation</b>	Title 14, Code of Federal Regulations, Aeronautics & Space Part 25, Airworthiness Standards: Transport Category Airplanes Subpart D, Design and Construction §25.831 (Ventilation) and §25.841 (Pressurized Cabins) Amendment 25-67  <u>Federal Register citation:</u> 61 FR 28965, June 5, 1996
<b>Authority</b>	49 U.S.C. 106(g), 40113, 44701-44702, 44704.
<b>Description of Problem</b>	<p><b>§25.831(a), Ventilation</b> – This section of the rule was revised to increase the current requirements for the amount minimum fresh (outside) air from "10 cubic feet per minute per crew member" to "0.55 pounds per minute per occupant (lb/min/occupant)," which represents 10 cubic feet per minute per occupant at an 8,000 ft. cabin altitude. The requirement of this section of the rule confines an applicant to limited range of specific designs that could comply with it. The rule does not increase safety: in fact, the majority of the current economy class areas in airliners today would not be able to meet the requirement even as they are now designed and equipped.</p> <p><b>§25.831(g), Ventilation</b> – This section of the rule prescribes temperatures and single point humidity criteria that cannot be exceeded in the airplane cabin after any improbable failure condition. The combination of temperature and humidity prescribed in the regulations is not representative of the common airplane operating environment, however. Complying with 525.831(g) requires illogical changes to airplanes that do not provide any safety enhancements, for example, the addition of a separate air conditioning system just for the improbable event of loss of all inflow from the current air conditioning system. The added air conditioning system design would be extremely difficult due to the single point humidity requirement, weight, and maintenance burden. Cost impact would be substantial. The requirements of §25.831(g) do not increase safety because, previous to the existence of the rule, aircraft manufacturers were already required to meet rational temperature conditions when showing compliance with §25.1309 (Equipment, systems, and Installations).</p> <p><b>§25.841(a), Pressurized Cabins</b> – This rule forbids occupants from being exposed to cabin altitudes above 25,000 feet for more than 2 minutes, or above 40,000 feet for any duration, for failure conditions not shown to be extremely remote. No large subsonic airplane with wing-mounted engines in service today can meet this rule without a substantial decrease in operating altitude (below that to which the airplane is certified to operate). This decrease would invoke severe economic and operating penalties for some current and future aircraft types. The rule does not increase safety significantly, as sudden decompression at cruise altitudes is extremely rare.</p> <p>The most significant problem with the requirements imposed by Amendment 25-87 is that they are prescriptive rather than performance-based. This drives specific design requirements and limits design innovation.</p>
<b>Proposed Solution</b>	One solution has been initiated; The FAA has tasked the Aviation Rulemaking Advisory Committee (ARAC) to develop and propose new rules to replace Amendment 27-87 as follows:

	<ul style="list-style-type: none"> <li>• <b>Base</b> new §25.831 (a) on input from recognized subject matter experts on defining air quality for safety and health; include existing, new, and ongoing research facts and data.</li> <li>• <b>Base</b> new §25.831 (g) on effective temperatures to preclude single point humidity. Base not-to-exceed temperatures on scientific human tolerance studies.</li> <li>• <b>Base</b> new §25.841 (a) on input from recognized aviation physiologists, human factor experts, NASA, Air Force, Navy, and other government studies.</li> </ul> <p>ARAC is expected to complete these tasks and provide recommendations for rulemaking to the FAA in early 2003.</p>
<p><b>Estimate of Economic Impacts</b></p>	<p>The current §25.831 (a) requires significant hardware and software changes to implement. Even with these changes, there would still be transient normal conditions where the rule could not be met due to engine flow supply limitations. Another option of meeting the rule requires placing limits on the seat density to the capacity of the outside air supply. At the airplane level, there are increased costs due to decreased engine fuel economy, along with increased engine emissions to the environment. No cost has been calculated but it is considered to be significantly higher than that calculated by the FAA in its economic evaluation of the rule.</p> <p>The current §25.831 (g) forces the addition of new air conditioning system(s) to meet single point humidity and temperature requirement and/or design and implementation of flight critical software. No cost has been calculated, but it is considered to be significantly higher than that calculated by the FAA in its economic evaluation of the rule.</p> <p>The current §25.841 (a) inhibits development of new subsonic airplanes and derivatives of existing models competitive with the existing fleet. The cost of this to manufacturers has not been quantified, but is considered to be significantly higher than that calculated by the FAA in its economic evaluation of the rule.</p>

<b>NAME OF REGULATION</b>	<b>TION: 14 CFR §25.601, Design and Construction, "General"</b>
<b>Regulating agency</b>	Department of Transportation/ Federal Aviation Administration
<b>Citation</b>	Title 14, Code of Federal Regulations, Aeronautics & Space Part 25, Airworthiness Standards: Transport Category Airplanes Subpart D, Design and Construction §25.601 (General) <u>Federal Register citation</u> : 29 FR 18289, December 24, 1964
<b>Authority'</b>	49 U.S.C. 106(g), 40113, 44701-44702, 44704.
<b>Description of Problem</b>	<p>The text of 14 CFR §25.601 is as follows:</p> <p><i>"The airplane may not have design features or details that experience has shown to be hazardous or unreliable. The suitability of each questionable design detail and part must be established by tests."</i></p> <p>This section is worded in such a general manner that it is applied inconsistently and often used as a "catch-all" by the FAA. That is, if there is a design item or issue that seems to the FAA to be non-compliant, but there is no regulation that specifically covers that particular issue of the airplane design, the FAA will deem it "non-compliant with §25.601."</p> <p>The general wording of this requirement, and especially the last sentence, is so vague that a reasonable person reading it would have no idea how to comply with it, and, consequently, the FAA has difficulty in standardizing a way to apply it. This non-standardized application has allowed the FAA to implement policy without any limitations defined in the regulations. It has also allowed the FAA to implement policy without prior notice and time for public comment.</p> <p>Current FAA policy has tied a myriad of different requirements to this regulation, for example seat belt misalignment, in-arm video abuse testing, and corded devices. The FAA has deemed these items "questionable design details" and, therefore, has applied §25.601 as the basis for addressing them.</p> <p>As this requirement is directly taken from the Civil Air Regulations (the precursor to today's Federal Aviation Regulations), and has not been amended, Boeing is unaware of whether this regulation has undergone a cost/benefit analysis.</p>
<b>Proposed Solution</b>	<p>This regulation should be deleted. The first sentence is covered by other regulatory mechanisms currently in place (such as Special Conditions and Airworthiness Directives). The second sentence is too general in nature and does not provide either the regulator or the public enough information to assess whether a design is compliant.</p> <p>If the regulation is not deleted, the FAA should provide resources for better training and monitoring of its specialists to ensure consistency in the application of the rule.</p>
<b>Estimate of Economic Impacts</b>	<p>Complying" with §25.601 -- for the myriad of items deemed applicable by individual FAA specialists in inconsistent practices -- entails substantial, constant costs throughout the year in terms of manpower, testing, and physical changes to airplanes. There are no data or metrics to demonstrate factually if these tests and changes have any impact on improving safety.</p>

NAME OF REGULATION: 14 CFR §25.785, "Seats, berths, safety belts, and harnesses"	
Regulating agency	
Citation	<u>Federal Resister citation</u> : 61 FR 57945, November 8, 1996 (Amendment 25-88)
Authority'	49 U.S.C. 106(g), 40113, 44701-44702 and 44704
Description of Problem	14 CFR §25.785 contains several vague terms, <b>which</b> has led to different interpretations by the FAA and a constant effort by the FAA and industry to understand, harmonize, and document the <b>latest</b> interpretations of these terms. The terms that are interpreted the <b>most</b> inconsistently are <i>injury</i> , <i>injurious</i> , firm, <i>moderately</i> rough air, <i>occupant</i> , and person. These terms should <b>be</b> clearly defined in the <b>text</b> of the regulation.
Proposed Solution	The terms " <i>injury</i> " and " <i>injurious</i> " that are used in §25.785 (b), (d)(2), (e), and (k) should be <b>more</b> explicit as to the type and severity of injury to be avoided. One <b>possible</b> solution is the use of the Abbreviated Injury Scale (AIS) published <b>by</b> the Association <i>for</i> the Advancement of Automotive Medicine (AAAM), which is in wide use in the automobile industry.
Estimate of Economic Impacts	portion of these pick-ups are directly attributed to the vague terms used in the

NAME OF REGULATION: 14 CFR §25.562. "Emergency landing dynamic conditions" (16g Seats)	
<b>Regulating agency</b>	Department of Transportation/ Federal Aviation Administration
<b>Citation</b>	Title 14, Code of Federal Regulations, Aeronautics & Space Part 25, Airworthiness Standards: Transport Category Airplanes Subpart C, Structure §25.562 (Emergency landing dynamic conditions) Federal Register citation: 53 FR 17640, May 17, 1988 (Amendment 25-64)
<b>Authority</b>	49 U.S.C. 1344, 1354(a), 1355, 1421, 1423, 1424, 1425, 1428, 1429, 1430; 49 U.S.C. 106(g) (Revised Pub L. 97-449, January 12, 1983); and 49 GFR 1.47(a).
<b>Description of Problem</b>	<p>The adoption of Amendment 25-64, "Improved Seat Safety Standards," to 14 CFR Part 25 has increased the complexity of seat and airplane interior certification tremendously. Due to this, the development and certification costs of a new seat design are significant not only to the seat manufacturer, but also to the seat installer. As seat designs and installations are commonly modified to suit each airline customer, this development and certification cost is an on-going expense. Unfortunately, the frequency of development and certification of seat designs, coupled with the large increase in the cost of those activities, were not reflected in either the notice of proposed rulemaking (NPRM) or the final rule for Amendment 25-64. In the proposed rule, the FAA labeled these costs "modest" and, in the final rule, labeled them "sunk costs" -- thus, considering them inconsequential in the cost/benefit analysis.</p> <p>The estimated benefit-to-cost ratio could still be greater than 1.0 if the benefits of implementing the regulation had increased from what was estimated; however, this has not been the case. Accident/fatality rates have declined since the initial cost/benefit study was performed. Additionally, the FAA sponsored a study (Report DOT/FAA/AR-00/13) to assess the number of serious injuries and fatalities that might have been avoided by the use of 16g dynamic seats in survivable accidents involving transport category aircraft during the period of 1984 to 1998. The study concluded that, over the entire period in question, there could be a reduction in the number of fatalities by 23, with a 95-percentile range from 12 to 40. This contrasts from the benefit analysis justifying the implementation of 25.562, which estimated that the number of fatalities avoided would be 32.58 in the year 1995 alone! The world fleet also was assessed, but the prediction was heavily biased by one accident where the improvement in occupant survivability due to §25.562-compliant seats is questionable. Based on the data available, the benefits that the FAA predicted with the implementation of §25.562 have not materialized.</p> <p>The requirements of §25.562 affect only new designs of aircraft. However, in 1998, the FAA also issued a proposed rule (Notice No. 66-8, Docket No. 25611, 3 FR 17650) -- known informally as the "Seat Retrofit Rule," -- that would expand the current regulation to require §25.562-compliant seats not only in new aircraft, but in all aircraft currently flying within the United States. The implementation of this proposed requirement would multiply many times over the current problems and costs associated with complying with the current regulation.</p>

	<p>proposed rule, the Aerospace Industries Association (AIA) provided a recommendation to revise the proposal. The recommendation suggested not implementing the injury criteria proposed for 925.562, and instead place emphasis on the structural capability of the seat under dynamic emergency landing conditions. The addition of the injury criteria adds a significant increase in complexity to the regulation, with little improvement in the safety afforded the passenger.</p> <p>As a minimum, the cost/benefit analysis performed for Amendment 25-64 should be re-analyzed.</p>
<p><b>Estimate of Economic Impacts</b></p>	<p>No precise estimate of the implementation cost of \$25.562 to the industry in general is available at this time; however, a very conservative estimation would be \$5 million a year just for The Boeing Company. The additional cost to seat manufacturers, airframe modification companies, and other US. airframe manufactures would most likely be in the tens of millions of dollars per year. These costs were not adequately captured in FAA's economic evaluation of the rule.</p>

<b>NAME OF REGULATION: Notice of Proposed Rulemaking (NPRM) 00-09,  "Improved Flammability Standards for  Thermal/Acoustic Insulation Materials Used in  Transport Category Airplanes"</b>	
<b>Regulating agency</b>	Department of Transportation/ Federal Aviation Administration
<b>Citation</b>	<p><b>Docket FAA 2000-7909, Notice 00-09</b> --Proposal to amend Title 14, Code of Federal Regulations, Aeronautics &amp; Space</p> <ul style="list-style-type: none"> <li>• Part 25, <b>Airworthiness Standards: Transport Category Airplanes</b> §25.853 (Compartment Interiors), et al</li> <li>• Part 91, <b>Air Traffic and General Operating Rules</b> §91.613 [Materials for compartment interiors]</li> <li>• Part 121, <b>Operating Requirements: Domestic, Flag, and Supplemental Operations</b> §121.312 (Materials for compartment interiors)</li> <li>• Part 125, <b>Certification and Operations: Airplanes Having a Seating Capacity of 20 or More Passenger6 or a Maximum Payload Capacity of 6,000 Pounds or More</b> §125.113 [Cabin Interiors]</li> <li>• <b>Part 135, Operating Requirements: Commuter and On-Demand Operations and Rules Governing Persons On Board Such Aircraft</b> §135.170 (Materials for compartment interiors)</li> </ul> <p>Federal Register citation: 65 FR 58992, September 20, 2000</p>
<b>Authority*</b>	<p><b>Part 25:</b> 49 U.S.C. 106(g), 40103, 40113, 44701-44702 and 44704</p> <p><b>Part 91:</b> 49 U.S.C. 106(g), 40113, 40120, 44101, 44111, 44701, 44709, 44711-44712, 44715-44717, 44722, 46306, 46315-46316, 46502, 46504, 46506-46507, 47122, 47508, 47528-47531</p> <p><b>Part 121:</b> 49 U.S.C. 106(g), 40113, 40119, 44101, 44707-44702, 44705, 44709-44711, 44713, 44716-44717, 44722, 44901, 44903-44904, 44912, 46105</p> <p><b>Part 125:</b> 49 U.S.C. 106(g), 40113, 44701-44702, 44705, 44710-44711, 44713, 44716-44717, 44722</p> <p><b>Part 135:</b> 49 U.S.C. 106(g), 40113, 44701-44702, 44705, 44709, 44711-44713, 44715-44717, 44722</p>
<b>Description of Problem</b>	<p>In Notice 00-09, the FAA has proposed a regulatory change that will impose <u>increased flammability resistance</u> and <u>increased flame penetration</u> ("burn-through) <u>resistance</u> for Insulation materials ("blankets") installed on commercial aircraft. This activity originated as part of FAA's efforts to address certain safety issues associated with metalized Mylar. (Note; "Mylar" is the Dupont trade name for polyethylene terephthalate or "PET.") As an intermediate step, the FAA required the removal and replacement of <u>this material</u> from portions of the commercial airline fleet via a series of <b>Airworthiness Directives</b>. The <b>proposed</b> rule would require newly <b>certified</b> airplanes to be equipped with blankets that meet the new <b>resistance</b> criteria; it would <b>also</b> require that the current fleet be retrofitted with such blankets.</p> <p>The Boeing Company supports safety enhancements to airplanes when the need for such enhancements is driven by well-accepted data and has a corresponding benefit for reducing accidents and fatalities. Boeing considers, however, that the proposed burn-through requirement is being mandated as a safety enhancement without measurable data or an <b>adequate cost/benefit analysis</b>. The economic valuation contained in the proposed rule <b>appears</b> to adjust the benefits upward without an established process or supporting rationale. The benefits are</p>

	<p>overstated because they are based on certain assumptions (i.e., about the post-crash integrity of the fuselage) that are not supported by experience (i.e., that there will be no holes or tears in the fuselage). It is important to note that each of the comments submitted to the public docket by the affected industry point out this failing of the economic evaluation.</p> <p>Contrary to statements made in the proposal, and after 5 years of efforts, no materials have been identified that could both (1) meet the proposed requirements and (2) satisfy the existing performance parameters of the current materials. All materials currently available are heavier and substantially more costly, resulting in an overall loss in performance across the Industry due to increased fuel burn and consequent environmental impact.</p>
<p><b>Proposed Solution</b></p>	<p>Boeing recommends that the rule be implemented as follows:</p> <p><u>Enhanced Flammability Resistance:</u></p> <ul style="list-style-type: none"> <li>(1) Implement this as a voluntary change for existing and derivative aircraft.</li> <li>(2) Apply the requirements to new type designs only.</li> </ul> <p><u>Burn-through Resistance:</u></p> <ul style="list-style-type: none"> <li>(1) Withdraw the proposed rule as not cost/benefit effective.</li> <li>(2) Provide general guidance recommending enhanced burn-through; and support the Industry with resources to develop a cost-effective approach.</li> </ul>
<p><b>Estimate of Economic Impacts</b></p>	<p>As proposed, the rule is estimated to impact Boeing alone as follows:</p> <ul style="list-style-type: none"> <li>• Revision to 30,000 part numbers for current production, resulting in approximately 240,000 man hours of engineering labor (est. \$36 million).</li> <li>• Recurring expenditures for engineering labor for out-of-production blanket orders.</li> <li>• Additional radiant panel testing and burn-through tests of multiple configurations: approximately \$3 million per year on-going for people and facilities.</li> <li>• To meet the burn-through requirements, approximately 70% of the blankets would have to be revised.</li> <li>• Extensive revision to 21,000 part numbers for current production, resulting in approximately 420,000 man hours of engineering labor (est. \$63 million). Recurring costs for more burn-through-resistant materials is not clear at this time. However, because this test is very stringent, required materials will be "exotic" (for example, ceramic paper, carbon precursor batting) compared to existing fiberglass, and are likely to result in appreciable recurring material cost increases.</li> </ul> <p>These costs were not adequately captured in FAA's economic evaluation of the rule.</p> <p><u>Impact of suggested solution</u> for a voluntary change (for flammability only) for in-production airplanes and rule change for new type design:</p> <ul style="list-style-type: none"> <li>• This will allow for lower cost, more immediate change based on a revision to material specification only (when a suitable material has been identified).</li> <li>• No part number changes as defined above will be required.</li> <li>• On-going testing will still be required.</li> </ul>